



## **O WORK IN THE SOLID WASTE SORTING PROCESS – APPLICATION OF EWA IN A COOPERATIVE IN SÃO CARLOS - SP**

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### **Abstract**

In general, the ergonomics concept is poorly used in recycling material sorting services, either due to a lack of information or the lack of conditions for its application. In the sorting process, most of the activities carried out involve repetitive movements, heavy lifting and transporting materials without the necessary equipment, causing fatigue and musculoskeletal injuries. Therefore, the aim was to use EWA to identify and assess deviations from recommended standards that put the worker's biosafety, health and well-being at risk. This made it possible to identify processes and equipment in irregular situations, such as the absence of benches or lumbar support, PPE and other equipment during the workday, the high repetition of a single action or function, the high risk of accidents, among other things, and thus highlight the need for interventions in order to guarantee a minimally healthy work process.

**Keywords:** Ergonomics. EWA. Sorting. Recycling. Health.

### **1. INTRODUCTION**

Concerned with obtaining resources for their own subsistence and that of their families, waste sorting workers are exposed to the risks inherent to the activity and adverse effects of this exposure are understood as normal work eventualities when, in fact, they characterize work accidents or irregular processes (Albizu, 2008).

In Brazil, as in other developing countries, the activities of collecting, sorting and recycling materials take place manually, without protection and/or with the use of obsolete equipment (Cornieri, 2011). The high turnover of workers in sorting cooperatives is directly associated with the precariousness and fragility of this work (Moises, 2009).

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As determining factors for workers to remain or not in this sector, there are working conditions, low remuneration, lack of opportunity to enter the formal labor market and factors inherent to contact with garbage (Moises, 2009).

Considering that adverse situations are directly related to vulnerability to illness (MS, 2011), it is essential to observe aspects of quality of life and work, access to the public health network and socio-environmental conditions for a better understanding of the worker's illness process (Ayres et al., 1999).

Most of the activities developed in the screening process involve repetitive movements, heavy lifting and transporting materials without the necessary equipment, leading to fatigue and musculoskeletal injuries (Albizu, 2008; Bleck 2012; Wettberg, 2012; Souza, et al., 2014).

When questioning about pain exclusively related to work, Souza et al. (2014), identified in workers allocated to the screening task, mainly complaints of pain in the upper and lower parts of the spine, in shoulders, arms and legs, characterized as "unbearable".

Another major risk to the health of workers is the proliferation of populations of rodents and insects responsible for the transmission of diseases such as leptospirosis, yellow fever and dengue, as a result of the often inadequate disposal of materials (FUNASA, 2010).

Another possible consequence of the inadequate organization of these materials is that this fact can contribute to the occurrence of accidents, from small cuts to mutilation of body parts by sharp objects (Cornieri, 2011).

## 2. METHODOLOGICAL ASPECTS

This study was carried out in a cooperative of waste pickers in the city of São Carlos, in the state of São Paulo, Brazil, formed in 2002 by workers from the city's landfill. This cooperative produces material processed from household solid waste (e.g. glass, cardboard, aluminum, plastic).

This cooperative provides services to the Municipality of São Carlos, receiving a basic infrastructure – a shed, three trucks and two presses – and payment when reaching the contractual goals.

For this research, it used the *Ergonomic Workplace Analysis* (EWA) methodology, a tool for a common understanding of the work situation, also serving to evaluate changes in the work environment, to compare different jobs with the same type of activity, to file information about the workplace, among others (FIOH, 1989).



The EWA is theoretically based on the physiology of work, biomechanics and occupational hygiene, psychological aspects and the participatory model of work organization, and may represent general and objective recommendations for healthy work (FIOH, 1989). This tool is based on 14 quantifiable items and representatives of projectable factors of health, safety and productivity of the workplace (FIOH, 1989).

Then, the ergonomics of the cooperative were evaluated using this tool, following the recommendations and standards described in its manual. After this collection, the data were processed and evaluated.

### 3. FINDINGS

The use of EWA made it possible to define, during the execution of the screening work (previously defined as an analysis cut) on two different tables, processes and/or equipment with deviations, large or small, from the standard recommendations for safe work that maintains the health of the worker. Figure 1 shows the dimensions of the sorting tables and Figure 2 represents the elucidation of the workstation.

In the analysis of the first item, Workspace, it was possible to identify that the workers used horizontal area 3 most of the time they performed their work activities, which is ideally intended for infrequent activities. The visual distance is, in general, compatible with the size of the materials worked and the angle of view varies between 30° and 60°.

There were no high stools, lumbar support, hand tools or other work equipment and utensils available to the workers.

The work is framed, mostly, as material handling in the standing posture. The sorting table is 80 cm high, leaving the materials, in general, very close to the lower limit (10 cm away from elbow level) and far from the upper limit (30 cm away from elbow level) of the recommended range in order to avoid musculoskeletal diseases. Knowing that the workers perform their work standing, the only irregular distance in this item, in addition to the work area, is that of the free space behind the worker, close to 60 cm.

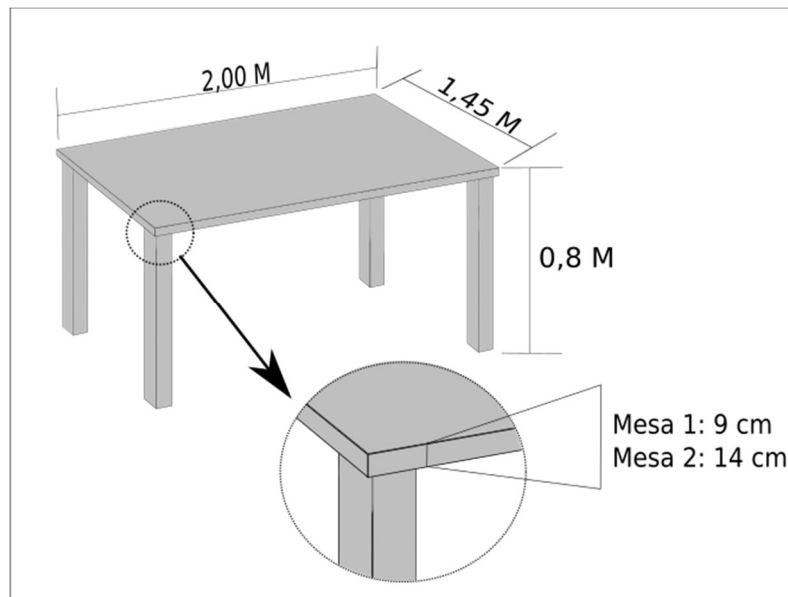


Figure 1: Dimensions of the sorting table. Prepared by the authors

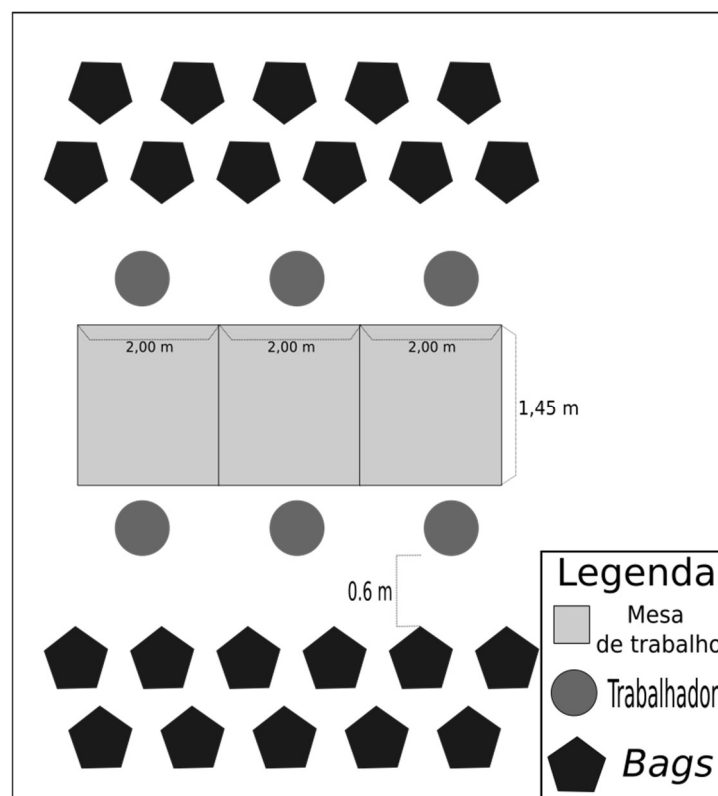


Figure 2: Elucidation of the workstation. Prepared by the authors

The second item, General physical activity, is carried out, whose necessary physical activity can be defined as optimal, since it depends on the organization of work and that peaks in workload do not occur frequently and do not produce a risk of excessive effort. However, the space and working method limit the work movements. To the third item, Load Surveying, the work was divided into two parts for analysis. The first would be the routine work of sorting, where the load can be easily lifted; The second would be the lifting of the bags to the sorting



tables, where loads are lifted to a height of 80 cm, with distance from the hands to the body between 30 and 50 cm, with the load weighing between 8 and 21 kg.

Regarding work posture and movements, all points of analysis (neck-shoulders, elbow-wrist, back, hip-legs) showed small deviations, evidencing limitations in meeting the recommendations.

However, when the Risk of Accident was analyzed, it was identified, during the work, the presence and handling of materials that may have sharp-cutting vertices and risks of poisoning due to the dispersion of aerosols and other volatile compounds. Thus, the risk of accident is very high and the severity can vary from mild to very serious.

With regard to Work Content, Decision Making, Repetitiveness and Attention, the worker, in general, is responsible for a simple task or just an operation of clear and unambiguous instructions, with an average duration of a repetitive work cycle below 5 seconds. Due to the short duration of this cycle, the observation time is negligible, representing less than 30% of the total value; However, the demand for attention can be framed as average, being an activity of positioning an element with a pattern.

The production method does not limit work and communication is possible during the execution of activities, being relatively limited by the location at the station and/or the need for concentration.

Regarding the characteristics of the workstation (lighting, thermal environment, noise), there is no glare of vision due to the presence of clear or radiant light, reflective surfaces or bright areas, the work environment presents small temperature variations, marked by the seasons, and there is an estimated noise level of approximately 75 dB under normal ambient noise conditions.

Thus, the following were attributed to constraints in work, decision-making and lighting, where the specifications are as close as possible to the ideal; general physical activity, lifting loads, work posture and movements, communication between workers and personal contacts and attention to value 2, indicating the presence of limitations in meeting the recommended standards, but with low risk of causing damage to workers' health;

As for the thermal environment, a value of 3 was assigned, indicating deviations from the recommended standards that may, over time, pose risks to the health of workers; to the workspace and the presence of noise in the work environment the value 4, which indicates large deviations from the recommended standards, making the work environment liable to cause



damage to the health of workers and; to the risk of accidents, work content and repetitiveness of the work the value 5, indicating major deviations from the recommended standards and that can commonly cause damage to the worker's health.

#### **4. DISCUSSION AND FINAL CONSIDERATIONS**

The EWA was used in this study in order to evaluate and indicate irregularities in the task performed on the sorting table, which requires manual skill and manual movement of materials.

The analysis allowed us to identify the presence of deviations from the recommended standard in most items. This data is consistent with what was found in the literature, showing how this type of activity is neglected from the point of view of safety and health, and is even on the margins of labor legislation.

Due to issues related to the organization of the workspace, work postures are irregular and inconstant. The workstation does not have a high bench or lumbar support, has reduced space for the worker's movement and does not have tools that help in the execution of the activity. The activity is performed standing, for approximately 8 hours a day, characteristically repetitive and with a certain demand for attention.

The risk of accidents is high and there is no presence or use of PPE, which leaves workers vulnerable to physical accidents (e.g. cuts, perforations), chemical accidents (e.g. inhalation of solvents and/or other volatile compounds present in the sorting materials), biological accidents (e.g. fungi, bacteria, viruses) and physical health problems (e.g. musculoskeletal diseases).

With this, it is possible to highlight the need for interventions that eliminate or, at least, mitigate the irregularities identified, with adequacy of the activity and the workstation in order to ensure the biosafety, health and well-being of the worker.

In order to validate the discussion carried out here, it would also be necessary for the workers to make a subjective comparative evaluation of the items analyzed. However, due to the epidemiological situation in the country due to the Sars-CoV-2 virus, it was not possible to carry it out, so this part of the process should be postponed.

With this, the objective of the research was fulfilled, in order to observe and classify the sorting process of solid waste collectors, seeking to identify points of improvement and proposals for these points.



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